HW-9 MOD's

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Areas Where Modifications Were Made

The HW-9 is a fine rig. However, it *does* have some problems as delivered by Heath. In this article, I hope to show how to improve the performance of the HW-9 and encourage others to try their own hand at problems areas that their rig may exhibit. Feel free to contact me with your own mods, or any questions that this material may create.

As mentioned in a previous posting, I will address a number of problems that my HW-9 had.

Please note that I find Molex IC pins to be invaluable when substituting components, as they can be individually installed for transistor, diode, capacitor, or resistor sockets. This saves damage to the PCB, and allows me to try different devices without reaching for the soldering iron each time, or removing or replacing the PCB between tests.

These socket pins come on a "tree" carrier that you can use for various IC pin counts, and are separated normally by snapping off the "tree" after installation. When used individually, they are a little more difficult to get installed straight without burning your fingers. I use a 1/4 watt resistor as a holding tool as I solder the individual pins.

VOLTAGE REGULATOR

Change U402 from a 78L08 to a 78L09 regulator, and replace D409 with a jumper wire. This will give you a nice solid 9 volt regulated supply with better regulation and slightly cooler operation of U402, as it isn't dropping as much voltage. I thought I could hear a very slight "chirp" on the transmitted signal before I made this change, and the original setup only provided about 8.6 volt with the diode in series with the regulator's ground pin. The diode is *not* in the error feedback loop of U403, so the regulation is not what it should be. The additional few tenths of a volt and better regulation are welcome in the VFO, second IF filter / amplifier, and AGC circuits.

Notice that as Heath designed the radio, the BFO isn't operating from a steady regulated source. Many critical circuits in the rig are powered direct from the poorly regulated 12 volt main supply, rather than an accurately regulated source. I will later describe mods to the PSA-9 power supply to correct poor regulation that can also contribute to frequency shifts during transmit. If you use a different power supply to run the radio, be aware that its stability under load needs to be good to keep the signal from chirping, as the BFO and HFO do not like an unsteady DC source. Frequency stability from these circuits is crucial to signal quality.

KEYING

The first thing I noticed when I received my HW-9, which I did not build, was that the keying was pretty soft. This was especially true when looking at the trailing edge of the keyed waveform on an oscilloscope. There was just too much of a "tail" on the key-up portion of the envelope. Although the HW-8 Handbook has some ideas on correcting this problem, I chose my own method, and it is simpler.

It seems that capacitor C578, a 47uf electrolytic, is way too large in value. I found I never needed to turn the Mute Delay

control anywhere near its maximum, and so I began to examine this part of the schematic for ideas. By simply changing C578 from 47 uf to 10uf, the key-up waveform edge became much shorter. After this change, I still have plenty of Mute Delay for all practical purposes, but I noticed the shortest setting of the control permitted a little T/R click to pass into the audio chain. It seems the large 47uf original value for C578 delays the turn-off characteristics of the keyed line.

By changing R444 from 180 ohms to 1500 ohms, the proper range of Mute Delay is preserved, and the T/R click is eliminated. There is a click at full audio gain, but this seems unrelated to the Mute Delay time constant. It may be due to the DC coupling from U306 to Q303, but I don't think it is significant unless you are hard of hearing and like to run your audio gain full tilt!

I also observed the leading edge of the keyed waveform is a little fast on rise time, and sounds kind of "hard" when monitored on a local receiver. A quick improvement for this behavior can be had by changing C435 from 2.2 uf to 4.7 uf. The rising edge of the keyed RF waveform is a little slower now and sounds better. Try several sizes of caps if you want to see what affect it will have.

RECEIVE SENSITIVITY

Heath has always tended to use the MPF105 junction FET in a lot of their kits. This device has a very poor transconductance, as mentioned in an article I read in 73 Magazine on "How to Make a HW-8 Come Alive", May 1996, by Gerald F. Gronson K8MKB. As he said, Heath couldn't have chosen a worse device for the RF amplifier in the HW-8. "A coupling capacitor would be a better choice than a MPF105", he writes.

This is also true for the IF amplifier preceding the crystal filter in the HW-9. Again, using Molex socket pins, I tried a number of FETs to see what could be achieved. Many higher gain FETs, such as the J310 and J309 seemed to have too much gain, and caused oscillation and instability without redesigning the entire amplifier stage and it's biasing, termination, etc. So I settled on a MPF102 (R/S pn. 276-2062, $0.99) chosen from a number of devices I had on hand.

A good increase in sensitivity is the result, and I used the current measurement through source resistor R305 as a guide to selecting a proper candidate. I also monitored a weak signal on the rig's S-meter for best signal strength as I chose the best device. Re-adjust T301 and the AGC threshold control, R329 after making this substitution as described in the manual for proper S-meter behavior. Use care and a proper tool to tune the slug in T301 so it does not crack or crumble.

AUDIO IMPROVEMENTS

The HW-8 Handbook mentions that capacitor C336, a 2.2 uf electrolytic, is installed backwards for polarity. This is certainly true, and it should be reversed from what is shown in the manual, schematic, and PCB silk-screening. If you like, you can try a slightly larger cap for C336 (using Molex pin sockets!) to see if the audio quality is improved. I kept the original cap but turned it around.

A mention is made in the HW-8 Handbook about substituting a TL084C quad FET op amp for the LM324 used at U304. This is supposed to retain the high impedance of the active audio filter and is claimed to be a quieter device. I had some TL084C ICs, so what the heck? I did not see a noticeable improvement, but if your audio filter seems noisy or if the bandwidth is not what you think it should be, give it a try.

I noticed the active audio bandpass filter center frequency is not the same as the crystal filter's center frequency. I still have to address this problem, but if your rig seems particularly poor in this respect, check R354 and R359 to see if they are close to 1.5 megohms and matched in value. C339, C341, C344, and C345 all need to be matched in value for best filter performance. Heath used ordinary ceramic disk caps for these, and they have only 20% tolerance or so. Use a capacitor meter if you have one, and select four caps that are as close as possible to use in the filter. If you don't have enough of these, remove several other .001uf disk caps from other places on the T/R board and select the four best candidates. Use the fall-outs for the other caps, since their circuits are not as critical.

Polyester or mylar caps have normally better tolerance, stability, and leakage than the ceramic disks used, so if you can get them - use them. I think the audio filter's center bandpass frequency should be shifted slightly lower than it currently is, so .0012 or .0015 uf caps might be a better choice here. I prefer not to parallel or series connect several components to get the value needed, so some parts searching is in order.

Using 1.8 megohm resistors for R354 and R359 might do the trick, but I haven't done the math or tried them since I didn't have any in my parts bins. Most other audio filters I have encountered do not use such high R and small C values. All new values for the filter might be the way to go, but the existing filter works pretty well - even if it is too high in center frequency for the crystal IF filter and my preferences. The S-meter and audio filter should peak on at the same frequency.

TRANSMIT STABILITY and POWER OUTPUT

I had no complaint about the output power level of nearly 7 watts maximum on bands 80m through 15m, but 15m seemed a little unstable. On 12m and 10m, the output was down slightly to 3 watts or so. On 15m, the CW Level control seemed to be non-linear when increasing and particularly *decreasing* the power level. I suspected some spurious behavior of the driver or PA stages. It turned out to be in the pre-driver stages.M

In the original design, Heath used MPS6521 transitors (Heath pn. 417-172) for Q401 and Q402, the pre-drivers that precede Q404. Q404 is a 2N3866 (Heath pn. 417-205) that is more than adequate in power gain and frequency. However, there are ferrite beads on the base leads of Q401 & Q402. I have found this to usually indicate a problem area that needs addressing, rather than taking a Band-Aid (tm) approach!

Sure enough, here is where the instability and loss of power output on 12m and 10m was found. If your rig's output level drops suddenly from a constant level as you reduce the CW Level control - especially on 15m for some reason - then you need to look into this.

After installing Molex pin sockets on Q401 & Q402, I began the tedious search for transistors that were both more stable and had greater output on the two higher bands. After trying perhaps 100 devices of maybe 5 or 6 types, I finally found the right combination. Q401 seems to be not as critical as Q402 is, and almost any PN2222, 2N2222a or MPS2222a will work fine for Q401. However, Q402 is a different subject entirely. Nearly every flavor of xx2222x device I tried caused spurious output and instability - especially on 10m. The ferrite beads offered no help in reducing this problem.

I finally found (after some mumbling and cursing) 1 or 2 2N3904 transistors that behaved well and gave decent output on 10m. Many of the 2N3904's I tried were simply "too hot" and caused a spur on the transmitted waveform between 3 and 5 watts output. The OHR WM-1 wattmeter also indicated a sharp increase in output level, due to increased harmonic / spurious output. The extra "trash" on the transmitted waveform was easily noticeable.

Apparently, without major changes in the circuit design, about 4 or 5 watts on 10m is the greatest output level that can be produced without excessive spurious content. I settled for this, using a prime MPS2222a (R/S pn. 276-2009, $0.59 ea) for Q401 and a MPS3904 (R/S pn 276-2016, $0.59 ea) for Q402. If you have several different manufacturing brands for the 2N3904 device, try them. Some behave quite differently from others, and you need to find one that is not too "hot" but has decent high frequency performance. Expect to spend some time trying quite a few before you find the *correct* device, and the Molex pins or sockets are a must for this selection process.

Note that the ferrite beads were of no help in reducing the spurs, and are *not* required or recommended with the transistors I recommend. The 2N4401 part mentioned by some was a poor performer compared to the 2N2222a / MPS2222a and 2N3904 / MPS3904 combination for Q401 and Q402, respectively. My final choices were *both* made by Motorola: Q401 is a MPS2222a and Q402 is a 2N3904, although Radio Shack lists it as a MPS device, it is actually branded as a 2N3904 device.

The final result is a broad range of adjusting the CW Level Control will produce from 7-8 watts on 80m through 12m, and about 4.5 to 5 watts on 10m, depending on the VFO setting. No instability or sudden changes in output level occur on any band, as it should be.

As mentioned in the HW-8 Handbook , I use and recommend NTE401 heat sinks for long life of the MRF237 PA transistors, especially if the ambient temperature is high (as in AZ on BUBBA day!) or if you enjoy long tune-ups, 5 watt operation, or rag-chewing. They will just fit if you adjust the position of T403 slightly. Use a small amount of themal compound before pressing the heat sinks into place. The bandswitch shaft will just clear the new heat sinks, that have one more fin and are slightly larger in diameter. Use one of the original heat sinks on Q404 if you like (it's not really needed) and rest confidently that the PA transistors Q405 & Q406 are much cooler in operation. Be safe and hold the output level at 5 watts maximum.

I'm curious as to why Heath didn't design the PA stage as a push-pull output, as it is almost as simple as the parallel PA design they used. One day I might try to change it to push-pull as that would insure the two transistors share equally in the load, and second-order harmonics would be even less. Some biasing changes might be necessary, but the parallel scheme works just fine, although if the two MRF237's aren't pretty close in characteristics, one of them will "hog" more of the load than the other. If your rig's output is low on all bands, one MRF237 is probably toasted.

AGC

The AGC is too fast for my tastes, and the S-meter tends to beat itself to death on CW signals as it jumps up and down on every CW character. There are a couple of ways to slow the AGC and S-meter operation. Either decrease the value of C317, a 3.3 uf electrolytic; or increase the value of R312. Or, do both! I decided to simply remove R312, a 47k 1/4 watt resistor that is the primarly discharge path for C317. This slows the AGC and S-meter quite a bit, and is easy to do. C317 then discharges through R311 and R309, as well as R316 and IF amplifier U301. Some discharge also occurs by way of D306 and the S-meter FET amp.

While trying several caps for C317, I found a 33 uf cap produced about what I wanted for the AGC time constant / S-meter

behavior. But I concluded such a large value of capacitance might load the AGC output level of U302, causing a loss of proper attack time and AGC peak voltage level. I therefore decided on removing R312, which produces about the same affect on AGC time constant with no additional loading of the AGC circuit.

TRANSMIT / RECEIVE TRANSITION IMPROVEMENTS

Much of the improvement of the T/R switching is achieved by the mods to the keying circuit mentioned earlier. However, some additional improvements can still be had by addressing the receiver muting. Transistor Q303 is a MPSA20 (Heath pn 417-801) general purpose device. It lacks the low ON saturation voltage and switching characteristics needed in muting the audio input to U306, the AF power output amplifier.

Using Molex pins again, I tried a large number of NPN transistors for Q303. Most of the high gain, low VsatON devices performed better muting of the audio line and helped reduce the small T/R pops during fast QSK settings of the Mute Delay adjustment pot. Believe it or not, the best device turned out to be a spare Heath transistor I had for my SB-104A transceiver! It is a Heath part number, 417-233, or a 2N3643.

If you can't find something similar, look for a high beta audio transistor with 600ma to 800ma maximum collector current rating. The NTE replacement guide shows a NTE128 as a possible part. Run the audio gain at near maximum while keying the rig at the shortest Mute Delay settings to find the quietest transistor. Note that you should *not* turn the AF gain to its maximum setting, as this will induce another T/R pop that is practically impossible to eliminate without further modifications. This was mentioned earlier in the section on KEYING mods.

It is also *not* necessary to increase the CW Level so that the rig is transmitting, unless you think the additional current draw might introduce more T/R noise. I did not notice this with my rig.

I should mention that a 2N7000 TMOS FET could be used as a muting transistor, but unless a discharge resistor is added from the Gate to ground, once the Mute signal is applied to the 2N7000's Gate, it will "latch" and not turn off during the return to receive! I tried a 2N7000 on mine, and although it worked well at killing the audio pops during Mute, I decided the 2N3643 worked just as well and did not require another resistor as the 2N7000 would. Several mods have appeared in various publications about putting a series Mute FET in the audio lead to the input of the AF power output IC, but this requires more effort and modifications than just finding the "right" muting transistor for Q303.

HELP FOR THE BFO, VFO, ETC.

If you still can't get enough output on your rig after doing the pre-driver mods for Q401 and Q402, you might have low output from the BFO circuit. Note on the schematic how the output level of the BFO is varied by the CW Level Control on the front panel. Diode D143 is used to shunt a portion of the BFO signal to ground before it is introduced into the SBL-1 bilateral diode ring mixer. This is a rather unconventional yet effective way to control the transmitted power level.

Since Heath commonly used the MPSA20 (Heath pn. 417-801) device in many kits and circuits such as the BFO in the HW-9, I figured it was probably not the ideal device for RF applications. Once again, some improvement can be gained by selecting a better device for some of the BFO stages. There are a couple of choices here to obtain increase BFO drive - both for the transmitter stages and also for the receiver's Product Detector. You can either pull out several of the Heath 417-801 transistors and select the best ones for critical circuit locations, or use another device altogether if you don't mind replacing the original Heath parts.

Since I had some Heath 417-801 spares from my SB-104A rig, I decided to pick a few of them for the BFO that gave me the most output without making any other changes. If you remove several 417-801 transistors from your HW-9, you can select the ones that perform best where they are needed. Otherwise, use MPS2222A, 2N2222A, or 2N3904 transistors that are widely available.

Using Molex pin sockets for Q113, Q114, and Q115, try several different transistors for the greatest and cleanest output of the BFO. Monitor the BFO level using the Heath provided RF detector at test point TP104, and / or the S-meter during transmit as it monitors relative power ouput. You should not increase the BFO's output to the point that spurious output is developed from overdriving the SBL-1 mixer and succeeding transmitter stages. You wouldn't want to undo all the work just done in the pre-driver stages by applying too much BFO injection!

I found a couple of 417-801 Heath transistors that were much better than the original devices in the BFO stages. The most critical device is Q113 for decent BFO injection to the receiver Product Detector, U303. For the transmitter BFO injection, Q114 seemed to be more a factor than Q115 (as you might expect!), and the increased BFO signal made available allows the CW Level Control to be adjusted to a lower setting for good output and smooth control of the PA output level.

In fact, the additional BFO output actually seems to make the CW Level Control more broad in its adjustment. This is probably

due to a greater available amount of BFO RF into D143 at lower settings of forward bias from the CW Level Control, rather than when it is almost biased completely off for greatest PA power output when only low BFO drive is present. D143 must have a more linear affect on the output level while it is still partially forward biased versus when it is nearly completely biased off.

The MPF105 used for the BFO oscillator turned out to be more than adequate, and so it was not replaced. After selecting your favorite part for Q113 - Q115, be sure to re-adjust the BFO frequency, and BFO filter inductor L137 as outlined in the manual.

Low VFO output can be corrected with a 2N3906 at Q106, or try several Heath 417-234 transistors (2N3638A) if you have them. My VFO does not exhibit much drift, and other info on tracking down excessive drift is covered in the HW-8 Handbook.

I used a 5.6K resistor across Transmit Return control R131 to make it less touchy to adjust. Just tack it onto the outside leads of the trim pot from the top the the PCB. If 5.6K is too small, try a 6.2K resistor instead. The object is to make the adjusment of the Transmit Return voltage very broad, rather than the difficult adjustment it previously was. Another method would be to use a smaller control than the 50k pot Heath provided, and adjust the ratio of R127 / R131, but the parallel fixed resistor across R131's terminals is easy and neat.

VFO DRIVE PROBLEMS

The small vernier drive used to tune the VFO cap has low torque, and the VFO cap is often mis-aligned with the drive mechanism, causing binding and slippage of the dial. I checked the VFO cap shield for squareness, and it seemed OK. However, the VFO capacitor itself seemed to be non-perpendicular from the rear mounting surface to the shaft. Many HW-9s have one of the VFO shields removed, since this makes the shields more rigid to flexing, with the result being the dial and shaft will bind.

Also, if the vernier is not properly mounted and the hex nuts at *each* end of the vernier tightened properly, there is not enough torque to overcome VFO drive friction. Be sure the vernier nut closest to the small pinion that is part of the VFO vairable cap is snug. If that is satisfactory, tighten *only* the front hex nut on the vernier to secure it to the VFO shield. It is wise to leave the three mounting screws on the rear of the VFO slightly loose and rotate the VFO through its entire range of rotation before final tightening of the vernier drive and the VFO capacitor mounting screws. Find the location of the VFO cap mounting that results in least binding.

If it still binds, either place thin shims between the VFO capacitor and the rear of the VFO shield, or leave the VFO cap mounting screws just slightly loose, but not too loose. Try turning the VFO cap to the point of greatest binding, and then make small movements in the vernier drive and/or VFO cap mounting screws until it frees up a bit.

I was able to retain the second VFO shield (which I had to fabricate, since it was missing from my HW-9) and find a workable adjustment of the shield and VFO mounting screws. The slide-on second VFO shield is useful in making the knob and tuning shaft "feel" more rigid, as without it, the single "U" - shaped VFO shield is inadequate for overall VFO rigidity. A "box" shape is many times more rigid than a "U" shape, so use both shields if you can without excessive dial slippage. The rotation of the dial should be light and free of binding if you can get it all to work out properly. It is a poor design, and *very* tempermental to assemble.

IMPROVING THE PSA-9 MATCHING POWER SUPPLY

Heath really did a bad job on the power supply for this great little rig. The original design has three series-connected 1N4149 diodes in the ground lead of a LM78L12 three-terminal 100 ma regulator. This is to compensate for the approx. 0.7 volt drop in the current-boosting transistor that is added to increase the output current capacity to 1 amp, and to also boost the output voltage to 12.6 volts or so.

This is bad practice for good voltage regulation, since the added diodes and series current-boost transistor are all outside of the LM78L12 regulator's error amplifier, which in itself is a pretty good device. It's just plain bad design, and whoever at Heath designed this should have known better. Heck, an ordinary LM7812 would be simpler and much better regulated, but I wanted to have the ability to adjust the output voltage and still have good regulation.

Enter the LM317T three-teminal adjustable regulator, (R/S pn.276-1778, $1.99) I stripped all of the parts off of the smaller terminal strip in the original design, and saved the diodes in the bridge rectifier. I decided to use a 4700 uf 35v filter cap instead of the 2500 uf 50v cap Heath provided. The Heath cap is probably adequate, but I had the Radio Shack electrolytic (R/S pn. 272-1022, $3.95) and felt the added filtering couldn't hurt.

Since I like a narrow range of voltage adjustment, I employed a 100 ohm trimpot for the fine voltage adjustment, and used fixed resistors to set the limits of voltage ranget. A 150 ohm 1/4 resistor is used from the output pin of the LM317T to the adjustment pin, and after doing some calculations and a few trial and error tests, I used a parallel combination of a 2.2K and 3.9K resculatibetween the adjustment pin and the 100 ohm trimpot that connects to ground. The resulting range of adjustment is about 13.1 to 14.1 volts, with 13.6 volts near the trimpot's center setting.

MAKING THE MODS TO THE PSA-9

Mount the 4700 uf 25 v (or re-mount the original 2500 uf 50v cap) electrolytic on top of the larger terminal strip to provide room to work on the new regulator circuit that is built on the small terminal strip. Remove Q1, and the small terminal strip from the power supply. Remove the pilot lamp assembly and save it for later re-installation. Strip all of the parts from the small terminal strip, and save the 100 uf cap for later re-use. The 1N4149 diodes, the 1 ohm 2w resistor, and the 1500 ohm 1/4 resistor can all be discarded or tossed into the junk box. Clean all of the solder, flux, and crud from the small terminal strip using a Solder Sucker or Soder Wick and acetone and prepare it as follows:

Cut the terminal strip so that it has only 7 lugs, with 4 on one side of the ground lug and two on the other side of the ground lug. Mount it with the 4 lug side towards the left edge of the power supply chassis as viewed from the front panel. This is flipped from the way it was originally mounted. You may want to pre-mount most of the following parts to the terminal strip temporarily mounted on the outside bottom of the chassis for convenient access to the lugs.

If you have another value for the trimpot, you'll need to experiment with the fixed resistors between it and the adjustment pin to get the 13.6 volts or so I think is ideal for the HW-9. Use another pot of 3K to 5K in place of the fixed resistor for a coarse control and use the small value trim pot you'll keep for the fine adjustment. Set the range with the 3K or 5K pot with the 100 ohm to 500 ohm fine adjust pot in its center setting. Then, measure the value of the 3K to 5K pot with an ohm meter and select a fixed resculatior combination of fixed resistors to match the measured pot value.

I soldered some 16 gauge wires to the LM317T 3-terminal regulator and covered the connections with insulating tubing. It is mounted in the same hole as Q1, (Heath pn 417-852, TIP31) the pass transistor was bolted, using the same insulating mica washer and nylon shoulder washer. I soldered the input pin of the LM317T to the positive terminal of the 4700uf 35v (or 2500uf 50v cap if you keep the Heath part), and connected the adjustment and output leads of the LM317T to the first and second lugs of the small terminal strip, as viewed from the front of the power supply, left-to-right. The 150 ohm resistor is connected from lug 1 to lug 2, and one end of each of the parallel combination of the 2.2k / 3.9K resistors are also soldered to lug 1, with the other ends soldered to lug 4.

The 100 ohm trimpot (a CTS blue knob miniature trimpot, like the ones Heath uses in the HW-9) is soldered facing up across lugs 4 and 6, with the center (wiper) lead in the bottom hole of lug 5. Bend the outer terminals of the pot so they are flat against the terminal lugs, and at a right angle.

I re-used the 100 uf electrolytic cap C2 from the old circuit for transient load suppression. The negative lead connects from lug 7 to lugs 6 and 5 (ground). The positive lead goes to lug 2 and 3 (output). Also run a wire from the bottom hole of lug 2, which is the output, to the fuse mounted on the back of the case. The pilot lamp is retained and connected to lugs 2 (output) and 7 (ground).

I heavily painted the terminals of the AC power slide switch with some red fingernail polish, so I would be less likely to touch 110v when adjusting the trimpot to the desired output voltage. You could also use some insulating sleeving if you re-dress the wires on the switch lugs slightly.

I noticed some voltage drop across the original 1 1/2 amp output fuse that reduces the loaded voltage regulation. I replaced it with a 2 amp fuse that had less series resistance and caused less voltage drop under load. A better solution would be to move the fuse to the unregulated side of the LM317T chip, between the filter cap and the input terminal. This would eliminate all fuse-induced voltage drop, and still provide the desired protection from short circuits across the output, and would also protect the LM317T and rectifiers better.

The new regulated supply is adjustable from about 13.1 volts to 14.1 volts, with 13.6 volts near the center of adjustment. Output current is more than 1 amp, typically 1.5 amps, and the ripple is below 1mv on my DVM under a load of 1.5 amps using a 8 ohm load resistor. The output voltage as measured between the power supply chassis and the input to the fuse does not measurably change from no load to 1.5 amperes. The only measureable voltage drop is in the wiring and connections to the HW-9, and this is only approx. 0.2 volt during transmit. The HW-9 now has a very stable power supply that is ripple-free and well regulated, further reducing the chance of any frequency shift of the BFO, or HFO, since they are supplied from the 12 volt (13.6 volt actual) PSA-9 DC supply.

REMOVING THE VFO CAP AND RESTORING THE POTS

I find it easier to remove the screws securing the back panel and middle shield to the sides of the chassis to permit room to remove the VFO capacitor. Leave the middle back panel screws alone, and spread the sides slightly to allow both the T/R and Oscillator boards along with the middle shield to slip back an inch or so. Then the VFO cap will come out easily if you have removed the tuning shaft extension and the four 4-40 nuts from inside the VFO shield.

If the pots for some or all of the front panel controls have gotten dirty or feel poor, you can unsolder the wiring and remove

them to be cleaned. By prying up the tabs that hold the back of the pots together, the resistance element and shaft can be removed. Clean the wiping contacts and the resistance elements with Q-tips or a toothbrush and Soft-Scrub (tm). Rinse everything well under water and dry. I use silicon grease on the shaft and shaft bushing to get that nice "feel" when rotating the pot. The RIT pot needs to have a little grease on its back cover to allow the center detent to act properly. Replace the pot cover and gently squeeze the tabs back in place with some large needle-nose pliers. This may save you some money on new pots, and will generally restore the pot's function to new condition.

SUMMARY

If you try some or all of these mods, please let me know how well they did or didn't work for you. I welcome your comments or observations. Note that Heath made several errors on the schematic, and that all of the active audio filter ceramic disc caps should be identified as 1000 pf (.001 uf), even though C339 and C341 are shown as 100 pf. Also, R354 is shown as 15 megohms, when it is really 1.5 megohms as R359 is. I am still trying to find out what device Q403 is, as the manual fails to mention it in the Semiconductor Identification Chart. It is only identified as a Heath part number 417-865, for which I have no information. There are surely more errors and omissions in the manual and schematic if you look for them.

Thanks for the interest in improving the HW-9, and try these ideas if you get a chance. I think you will like the results. For more info on improving the crystal IF filter, see the ARRL's Hints and Kinks for the Radio Amateur, 13th edition, pages 1-4 and 1-5. I have the Kenwood IF filters to do this mod, but I think I'll use the radio as-is for a while before getting out the soldering iron again. ;-)

72 and good luck with your HW-9!

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